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November 24, 1998

Ms. Magalie R. Salas, Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In re: CC Docket No. 98-42 (RF Lighting Devices)
Ex Parte Communication

Dear Ms. Salas:

On November 23, 1998, Peter Murray and the undersigned representing Ericsson Inc., met with Peter Tenhula of the Office of Commissioner Powell to discuss issues related to the Notice of Proposed Rule Making in the proceeding described above. Also in attendance at the meeting were Mr. Jim Zyron of Harris Corporation and Mitchell Lazarus, Esq. representing Harris Corporation, 3 Com and Symbol Technologies.

Ericsson described the Bluetooth Special Interest Group which is comprised of more than 200 companies world wide who are developing Part 15 wireless unlicensed devices to be used to connect PCs and wireless phones including, but not limited to, cellular and PCS phones. Bluetooth devices will be marketed throughout the world. Ericsson expressed the view that deployment of RF Lighting devices with unlimited RF power could cause significant interference to unlicensed Part 15 devices operating in the 2.4 GHz ISM band. Ericsson described how operation of RF Lighting devices would adversely impact a number of proposed Bluetooth applications including wireless hands-free devices to be used in vehicles.

No. of Copies rec'd 0+1
List ABCDE

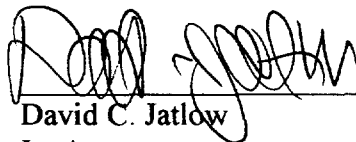
Ms. Magalie R. Salas
November 24, 1998
Page Two

Attached is a copy of the written material Ericsson provided to Mr. Tenhula which describes Bluetooth. Also attached is a copy of a November 19, 1998 written ex parte presentation Ericsson submitted in this docket which was provided to Mr. Tenhula.

An original and one copy of this letter is being submitted for inclusion in the docket in this proceeding. A copy is also being hand delivered on this date to Mr. Tenhula.

Respectfully submitted,

Ericsson Inc.



David C. Jatlow
Its Attorney

cc: Peter Tenhula, Esq.

Interest Group

Bluetooth Usage Examples



The Brief Case Trick (hidden computing)

☐ Laptop in briefcase

▼ E-mail alert through phone

▼ Browse E-mails in phone

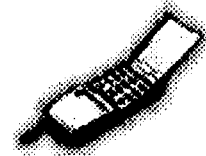
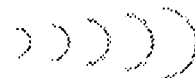
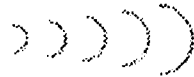
☐ Phone off (in airplane)

▼ Answer mail on laptop

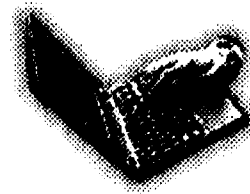
▼ Send mail from phone or laptop at arrival



@



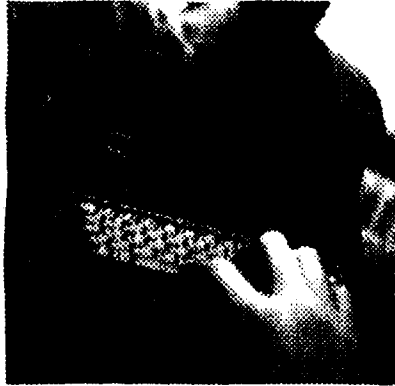
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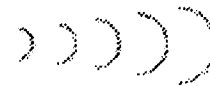
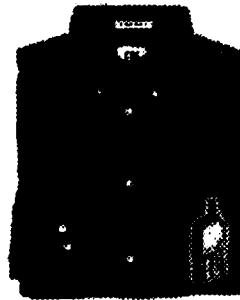
The Internet Bridge

☐ **Mobile browsing**

- ▼ on the go
- ▼ in the office
- ▼ in the car
- ▼ in the sofa



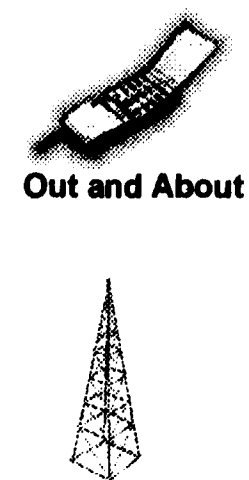
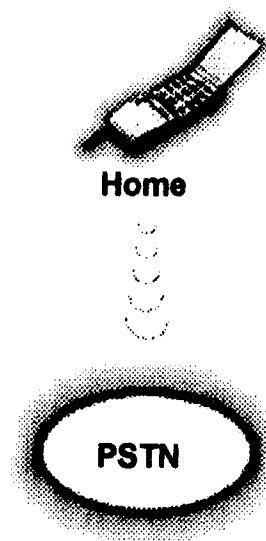
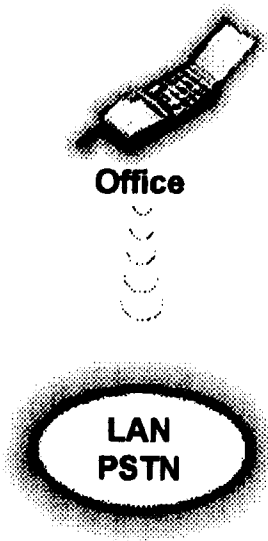
PSTN
ISDN
LAN
xDSL



The Three In One Phone

☐ One Phone three functions

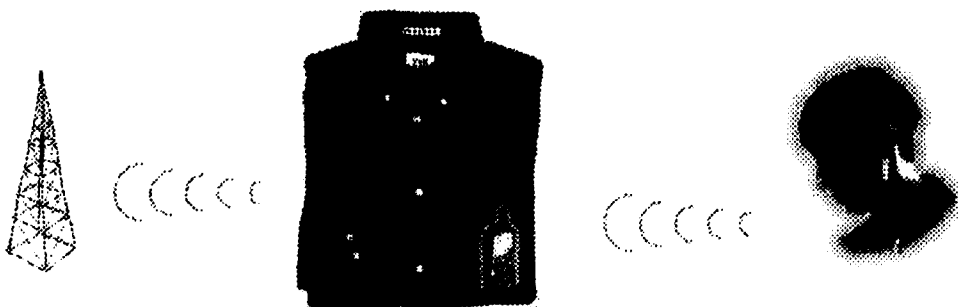
- ▼ Intercom (no telephony charge)
- ▼ Portable (fixed line charge)
- ▼ Cellular (cellular charge)



The Ultimate Headset

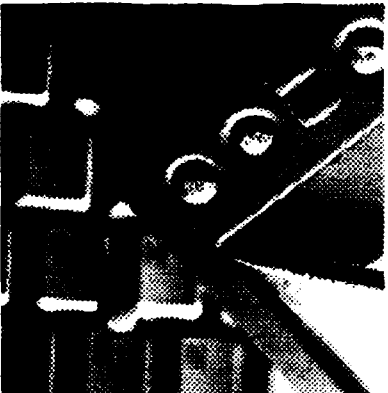
☐ **Keep your hands free with the ultimate solution for the:**

- ▼ Road
- ▼ Office
- ▼ Car



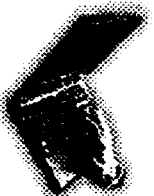


The Synchronizer (hidden computing)



☐ Background synchronisation

- ▼ PC-PDA
- ▼ PC-HPC
- ▼ Phone-PC
- ▼ etc.....



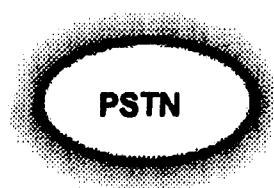
Interest Group



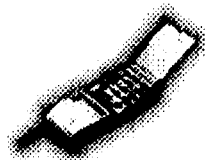
The Speaking Laptop

☐ **Use the laptop as a speaker phone**

- ▼ In the office
- ▼ On the road
- ▼ At home



or

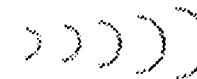
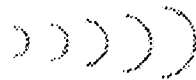
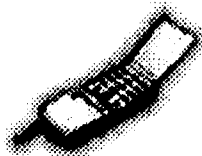
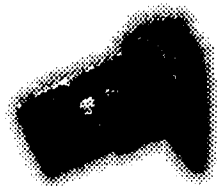


The Instant Postcard

- ❑ **Send instant postcards and video clips**

- ▼ Add comments with phone keyboard or PDA

- ▼ Personal and professional use

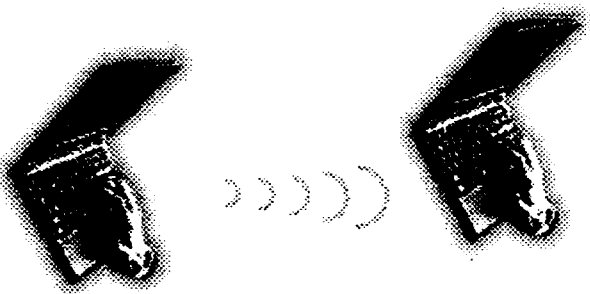
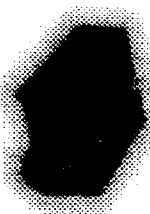


GSM
D-AMPS
PSTN
etc....



The Conference Table

☐ Share and exchange data
in the meeting room



Bluetooth Features & Benefits

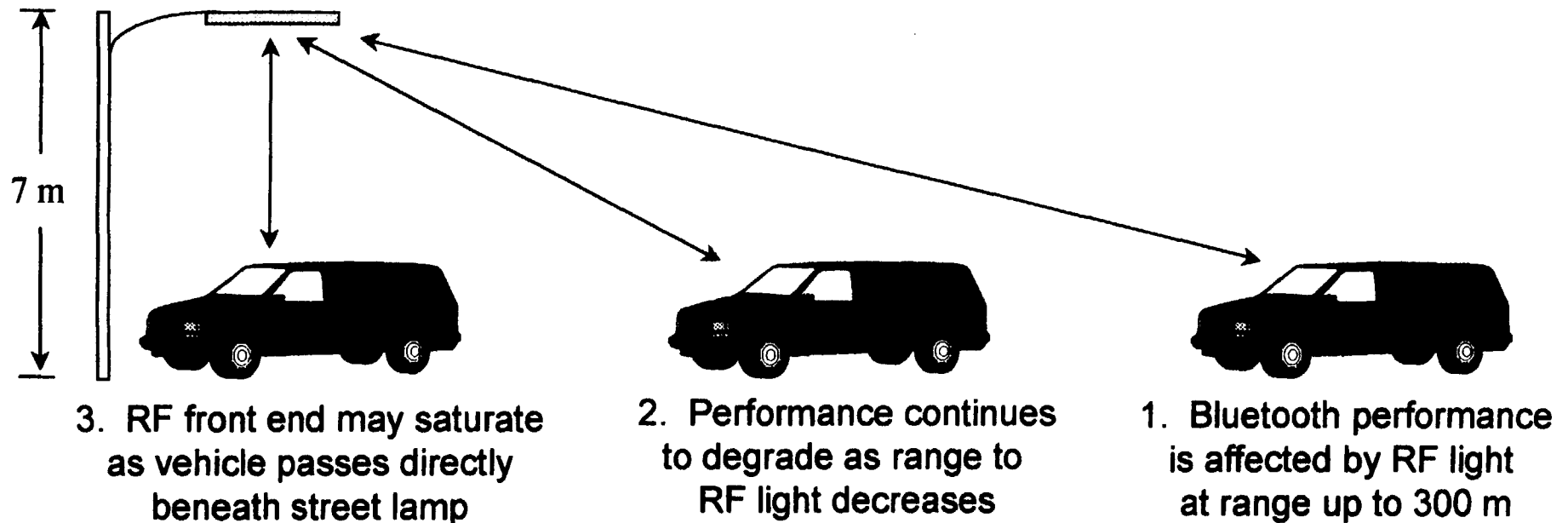
- ▶ **2.45 GHz FHSS low cost, low power radio**
- ▶ **Provide wireless connectivity between cell phones, laptops, peripherals, etc.**
 - ▼ enable automatic download of e-mail from wide area cellular network to portable computing device
 - ▼ TDMA voice capability
 - ▼ Possible usage includes means to shutdown cell phones on commercial aircraft
 - ▼ enables hands-free operation of cell phones via a wireless driver headset

Hands Free Cell Phone Operation

► **Scenario: RF Lighting installed on public roadways**

- ▼ RF emitter (light) mounted on pole 7 m to 10 m above roadway
- ▼ can radiate up to 3W (+35 dBm) in 2.45 GHz band
- ▼ Begins to degrade Bluetooth link at range up to 300 meters
- ▼ Performance continues to degrade as range between RF light and Bluetooth receiver decreases.
- ▼ Bluetooth receiver front end may saturate directly below light tower (radio temporarily rendered inoperable).
- ▼ There may be many street lamps within 300 meters

Hands Free Cell Phone Operation



- **Bluetooth link performance could be affected by RF lighting**
- **Degree of degradation depends on proximity to lighting device**
- **Many lights might be within range (300 m) of a given point**

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November 19, 1998

Ms. Magalie R. Salas, Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

In re: ET Docket No. 98-42 (RF Lighting Devices)
Written Ex Parte Communications

Dear Ms. Salas:

Attached hereto, on behalf of the Bluetooth Special Interest Group is a written ex parte presentation for inclusion in the record of the above-referenced proceeding.

The written ex parte presentation notes that adoption of rules proposed in ET Docket No. 98-42 may cause harmful interference to Part 15 devices operating in the 2.45 GHz ISM band. The presentation describes such a scenario when Part 15 devices, such as Bluetooth devices operating in vehicles, are in the proximity of RF Lighting devices which are located along a highway. It should be noted, however, that RF Lighting devices will be used in a wide variety of environments, including but not limited to, conference centers, near schools and in residential and commercial neighborhoods. Thus, the potential for harmful interference to be created to a wide variety of Part 15 devices in a wide variety of indoor and outdoor residential and commercial environments, is substantial.

Copies of this written material are being delivered this day to Chairman Kennard, Commissioners Ness, Furchtgott-Roth, Powell and Tristani, Mr. Dale Hatfield, Mr. Julius P. Knapp, Ms. Karen Rackley, Mr. John Reed and Mr. Anthony Serafini.

Respectfully submitted,



David C. Jatlow
Counsel for Ericsson Inc.

Magalie R. Salas
Secretary
Federal Communications Commission
1919 M Street NW
Room 222
Washington DC 20554
USA

Cc: Chairman William E. Kennard
Commissioner Susan Ness
Commissioner Harold Furchgott-Roth
Commissioner Michael K. Powell
Commissioner Gloria Trastani
Dale Hatfield
Julius P. Knapp
Karen Rackley
John A. Reed
Anthony Serafini

BLUETOOTH Promoters comments on the ET Docket No. 98-42

The Bluetooth Special Interest Group (SIG) is a consortium, with founding members (Promoters) Ericsson, Intel, Nokia, IBM and Toshiba. The consortium was formed in the beginning of 1998 to promote a technology for short-range wireless connectivity. Our technology, code named Bluetooth, is intended to be a "cable replacement" operating in the 2.45 GHz ISM band under Part 15 at an output power of maximum 100 mW, giving a range of roughly 100 meters.

Designed for the 2.45 GHz ISM band will allow global usage of the Bluetooth system. The promoters have committed to integrate the Bluetooth system in their products, which include cellular phones, personal computers etc.

The Bluetooth Promoter companies have invited other companies to sign an Adopters Agreement in order to acquire a free license to the Bluetooth System Specification. So far more than 220 companies have signed this agreement, which makes the Bluetooth Special Interest Group the largest initiative for a new technology, merging the telecom and computer industry.

The list of Adopters (see Appendix A) contains a lot of major corporations from all parts of the world as well as smaller emerging businesses.

As can be seen from this list the Adopter companies represent many different businesses, also outside the telecom and computer area. This indicates that Bluetooth has a great potential to be a true ad-hoc standard for wireless connectivity in the office, in the home or while travelling. Applications will target both businessmen and the public.

The Commission has in April this year released a Notice of Proposed Rule Making, under ET Docket No. 98-42, which propose amendment of Part 18 of the Commissions Rules to update the regulations for RF Lightning Devices. The Bluetooth system is designed based on the understanding that we have to cope with interference from other systems sharing the band with us. Bluetooth uses Frequency Hopping Spread Spectrum (FHSS) with 79 hopping channels and a hop rate of 1600 hops/s. We also employ a speech coding algorithm, known as Continuous Variable Slope Delta modulation (CVSD), which provides a graceful degradation. However, we feel that the approval of ET Docket No. 98-42 for RF Lightning Devices will increase the interference to other systems beyond what was originally considered, when Part 18 ISM devices were allowed to radiate unlimited RF power.

Apart from Bluetooth, there are also other systems targeting use of the 2.45 GHz ISM band. IEEE 802.11 Wireless LANs are becoming more popular and there are other new communication technologies emerging, targeting the 2.45 GHz operation according to Part 15. Bluetooth and other communication systems must share the spectrum with Part 18 ISM devices. The most widely used ISM device is probably the μ -wave oven. However, in our opinion there is a very strict difference between RF Heating devices, like μ -wave ovens and RF Lightning Devices. The former is installed in specific and generally known locations, like restaurants and in many private households, while RF Lightning devices can be installed both indoor and outdoor, in both private and public places. Another, very important difference is that while RF Heating devices operate with a duty cycle in the order of 1 % during a day, RF Lightning Devices will in many applications operate continuously.

With a maximum deployment scenario for RF Lightning devices (outdoor and indoor), it is probable that the interference level created, will significantly reduce the capacity of communication systems like Bluetooth, IEEE 802.11 WLAN and other Part 15 systems.

The Bluetooth Promoters would like the Commission to postpone the approval of ET Docket No. 98-42 until further investigations have been done on the effect of unlimited radiated power from part 18 RF Lightning devices on Part 15 communication systems. If it in such studies indeed is found that RF

Lightning devices will create an interference level, which significantly degrades performance of part 15 devices, like Bluetooth, then we ask the Commission to deny approval of the proposed Amendment to Part 18 or to put limitations on radiated power from RF Lightning devices in the 2.45 GHz ISM band. If this is not considered there is a risk that the public can not benefit from the wide range of applications that Bluetooth can provide.

The investments made in existing systems like IEEE 802.11 and emerging new technologies like Bluetooth, in the next few years is in the order of Billion USD. These investments should be protected by careful investigations of the probable major increase in interference level in the 2.45 GHz ISM band spectrum, caused by new part 18 devices like RF Lightning devices.

To show the effect that RF Lightning devices probably will have on Bluetooth devices the following user scenario is presented. This is just one of the many scenarios for usage of a "cable replacement" system like Bluetooth. It is also not a worst case situation for coexistence of RF Lightning devices and Bluetooth.

User Interference Scenario

Bluetooth head set used as a Hands Free unit for a cell phone. The user is driving his car on a public road, where RF Lightning devices are mounted on poles. The following is the assumed characteristic of the RF Lightning device:

- Located at the top of a pole 7 meters above the road
- Leakage output power 3 W (+35 dBm). This is probably a quite conservative number. It has been very hard to retrieve information about the true leakage power of actual RF Lightning devices.
- Frequency band: 2450 +/- 50 MHz. Spectral bandwidth not known but assuming similarity with microwave ovens give nominal bandwidth less than 500 kHz. Due to power supply design, the radiated energy will in many cases sweep across the band.

The following is the simplified characteristics of the Bluetooth system:

- C/I = 14 dB (Co-channel)
- Output power, $P_R = 0$ dBm. With optional power control even lower depending on distance, down to -30 dBm.
- Distance head set to cell phone = 1 m.

Assuming free space propagation, the path loss from light pole to car (L_L) and from head set to cell phone (L_B), can be calculated:

$$L_P = 20 \log(4\pi D/\lambda) ; D=1 \text{ m} ; f= 2450 \text{ MHz} ; \Rightarrow L_P = 40 \text{ dB.}$$

The Limiting interference level (I_R) at Bluetooth receiver front-end (start of performance degradation) is then derived as:

$$I_R = P_R - L_P - (C/I) = -55 \text{ dBm}$$

It is now possible to calculate at what distance D_L from the light pole (where the RF Lightning device is placed), the interference level I_R is reached:

$$L_L = 35 - (-55) = 90 \text{ dB} \Rightarrow D_L = 308 \text{ meters.}$$

Now let's assume that the car is driven directly under the light pole with the RF Lightning device and let us calculate the interfering level in the car, I_L .

$$I_L = 35 - 57 = -22 \text{ dBm (free space propagation, 7 meters distance)}$$

Conclusion

From the above simple, but far from worst case scenario, it is shown that the interference levels generated from RF Lightning devices, operating continuously for many hours, is likely to cause degradation to systems like Bluetooth, even if this system employs frequency hopping, because:

- Within a 300-meter radius there is likely to be many RF Lightning devices, operating at different frequencies and therefore degrading multiple channels in the frequency band for part 15 devices.

- Interference levels closer to the emitting RF Lightning device may block the front-end in the receiver in Part 15 devices like Bluetooth and prevent operation.
- The above calculation assumes that the wanted signal level at the Bluetooth receiver input is in the order of -40 dBm. In fact, with power control and a reference sensitivity level of -70 dBm, the power at the receiver input will often be much lower than -40 dBm, thus increasing the risk of interference. It should be noted that the Bluetooth system is designed to be less susceptible to interference than many other systems, yet it is probable that considerable degradation is the result of the above-described scenario.

Respectfully Submitted
On behalf of the Bluetooth Promoters

Anders Svensson M.Sc. EE
Manager - Certification & Verification
Short Link Technology

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Email: anders.svensson@ecs.ericsson.se

APPENDIX A

The following companies have joined the Bluetooth Special Interest Group from the launch events in May 1998 until November 1998.

3Com (Palm, Megahertz, 3com, USR)
AB Transistor
Acer America
Acer Peripherals Inc.
Adaptive Solutions
ADBS Corporation
Adherent Systems Ltd
Advanced Micro Devices
Agent Systems, Inc.
AKG Acoustics GmbH
Alantro Communications
Alps Electric Co.Ltd
Ambit Microsystems Corp.
AMP Wireless Systems
Analog Devices
Ann Arbor Electrogram Libraries
APT Technologies, Inc
AR Design Inc
ArcSecond, Inc.
ARM Ltd.
Ascom
Asulab SA
ATL Research A/s
Atmel Corporation
Atmosphere Pty Ltd
AU System
Axis
Bang & Olufsen Telecom A/S
Bar-Mail AB
Berkeley Concept Research Corp
Biosys AB
Bitstream AB
BreezeCom Ltd
Butterfly, VLSI Ltd
C Technologies
C-One Technology Corp
Cable + Wireless Communications
California Eastern Laboratories
Cambridge Consultants Ltd
CAPCAD AB
Caring Technologies
Casio
Celcius Research Ltd
Celsius Testsystems AB
Centura Software Corp
Cepcon GmbH
CETECOM GmbH
Cirrus Logic
ComBit Inc
CommAccess Technologies, Inc
Compaq Computer Corp
Convergence Corporation
Cooperative Research Centre Broadband Telecommunications
Cosmic Co.Ltd
Creative Digital Publishing, Inc

CRONUS-V
Crystal
D.S.R. Ltd
Dassault Electronique
Data Hunter
Datum Telegraphic Inc
Daugherty & Associates
Dell Computer Corp
Depelopment Corp
Desktop Products
Digianswer A/S
Dighouse
Domsilica
Dynamical Systems Research Ltd
E-Ink
ECSAB
EIMC
Electromagnetic Science
Elektronikhuset
ELSA AG
Eltex
Elvior OU
Embedded Design Specialists Inc
Enator
Enserve
Ensure Technologies
Eureka Technologies. Ltd
Everex Systems Inc
Extended Systems
FAB Systems
Geoworks
GN Netcom AS
Hand Held Products
Harris Corporation
Hasselblad
Hayes Microcomputer Products
Hewlett-Packard Co
Hong Kong Telecommunications Ltd
Hosiden Corp
Hotline
HPM Industries Pty Ltd
iCOM Inc
ID express Oy
Informed Technology Inc
InnoLabs Corporation
Innovative Global Solutions
Institut für Halbleiterphysik Frankfurt (Oder)
Institute for Information Industry
Integral Design
Integrated Communications
Intelli Worxx
Intellicom
Intermec
Internet Solutions for Business
Inventec Electronics Co. Ltd
Inventel Systems
Invision IT Systems Pty Ltd
iReady Corp
Istari Design
JABRA Corporation

Japan Aviation Electronics
JavaSoft
Jeeves Telecom Ltd
Jenkins Technologies
Jenkins Technology
Jep Electronics
Johnson Controls
Keycorp Ltd
KVASER AB
Linkup Systems Corp.
Linköping University
Live Media Pty Ltd
Logitech SA
Logivox Software, Inc
Lucent Technologies UK Limited
Luxsonor, Inc
M P Kelly Medical P/L
Mainbrace Corp
Materials Corp
Maxim Integrated Products, Inc
MECEL AB
Media Options
Metricom
Microlise Eng
Minec Systems
Mining Industry Resources
Mistral Int'l Pty Ltd
Mitel Semiconductor
MITRE Corporation
Mitsubishi
Mitsubishi Electric Co
Mobilink Telecom, Inc
Motorola
MP Kelly
MPC
National Semiconductor Corp
NCR Corporation
NeoParadigm Labs, Inc
NERA ASA
Netport Systems P/L
NGK Spark Plug Co. Ltd. / NTK Technical Ceramics
NTT DoCoMo
Olicom, Inc
one2one
Option International
Optionexist Ltd.
Ortivus AB
Oticon A/S
PC Card International AB
PCS PC-Systeme GmbH & Co.KG
Personal Electronic Devices, Inc
Philips
Philsar Electronics, Inc
Phoenix Technologies Ltd
Phonak AG
Physio-Control
Pin Point Corporation
Plantronics
PLEXTEC Ltd
Polar Electro Oy

Pretec Electronics Group
Primax Electronics Ltd
Protocol
Proxim Inc
PSDB
Psion Computers PLC
Psion Dacom PLC
Puma Technologies
Quadriga Lda
Qualcomm. Inc
Quanta Computer Inc.
Radio Design Ltd
RadioLAN
Ratio
Research Media & Marketing Consultants
Resound Communications
RF Micro Devices
RF Monolithics. Inc
RightNet. Inc
RStream Communications
RTX Telecom A/S
Safelink Technologies Inc
Samsung Electronics Ltd
SE Communications
Seiko Epson Corporations
Sharp Corp
Shockfish
Siemens Försvarssystem A/S
Sigma Exallon Systems AB
Silicon & Software Systems
Silicon Wave Inc
Simple Silicon
SK Telecom
SKF Nova AB
Smart Technology Enablers
SMS Telecom AB
Socket Communications
Solomon Wireless Technology
SolutionNet. Ltd
Somedic Production AB
SpaceTime
Sprint PCS
SSL
ST Microelectronics NV
Stanford Telecommunications Inc.
Strategic System Resource Group
Svensk Aktuell Elektronik AB
Symbian
Symbionics. Ltd
Symbol Technologies
System Innovation AB-Possio
T-Span System
T-Span Systems
TAC AB
Tacholog
Tagmaster AB
TDK
Ted Liao Consulting
Tee Pee Nominees
Teklogix

Telelogic
Telex Communications
Telia
Telital
Temic Semiconductor
Texas Instruments
The Boeing Company
Thrustfield Programs Ltd
Traveling Software, Inc
TTP Communications, Ltd
Universal Empowering Technologies
USAR Systems
Useful Tools
VADEM Ltd
Veriteq Instruments
Via Inc
Vienna Systems Corporation
Visteon Automotive Systems
VLSI Technology, Inc
Volvo Technological
VTT Building Technology
W.C.T Pty Ltd
Wavecom
WestLB Panmure
Widcomm
Wild Innovations
WIPRO Limited
Wireless Solutions Sweden AB
Wireless logic Int'l Ltd
Wireless Online
Wong's Electronics Co. Ltd
Xemics
Xircom
